Human Body Systems
14256

Rationale Statement:
Students examine the interactions of body systems as they explore identity, communication, power, movement, protection, and homeostasis. Students design experiments, investigate the structures and functions of the human body, and use data acquisition software to monitor body functions such as muscle movement, reflex and voluntary action, and respiration. Exploring science in action, students build organs and tissues on a skeletal manikin, work through interesting real world cases and often play the role of biomedical professionals to solve medical mysteries.

Suggested Grade Level: Grades 10 or 11

Topics Covered:
Identity: skeletal system, tissues, cells, and molecules
Communication: nervous and endocrine systems
Power: digestive, respiratory, and urinary systems
Movement: cardiovascular and muscular systems
Defense: integumentary and immune systems
Homeostasis

Indicator #1: Identity: skeletal system, tissues, cells, and molecules	
Webb's Leveling	Standard and Examples
Recall	**HBS 1.1** Display information about human body systems using graphic organizers.
Recall	**HBS 1.2** Design a visual system that demonstrates correct use of directional and regional terms.
Recall	**HBS 1.3** View prepared slides of human tissue and compare and contrast the structure and function of various types.
Recall	**HBS 1.4** Identify and locate bones of the human skeletal system.
Skill/Concept	**HBS 1.5** Build muscles and fat of the face on a skeletal model to explore personal identity.
Skill/Concept	**HBS 1.6** Diagram the relationship between multiple human body systems.
Skill/Concept	**HBS 1.7** Digest DNA samples using two different restriction enzymes.
Strategic Thinking	**HBS 1.8** Analyze bones to determine a person's gender, age, stature and ethnicity.
Strategic	**HBS 1.9** Run gel electrophoresis and analyze the resulting

Thinking	restriction fragment length polymorphisms (RFLPs) to link a missing person with skeletal remains.
Extended Thinking	**HBS 1.10** Read an interview with a forensic anthropologist and write an interview with a DNA analyst.

Indicator #2: Communication: nervous and endocrine systems	
Webb's Leveling	Standard and Examples
Recall	**HBS 2.1** Identify major regions of the human brain.
Recall	**HBS 2.2** Identify types of communication that occur inside the human body.
Recall	**HBS 2.3** Investigate the history of brain mapping technology, including the mapping of the motor cortex and the language centers of the brain.
Recall	**HBS 2.4** Produce a concept map for the endocrine system.
Recall	**HBS 2.5** Diagram the path of light as it enters the eyes and travels to the brain for processing.
Recall	**HBS 2.6** Produce a flow chart that outlines what goes on in the body from an initial stimulus to a response.
Recall	**HBS 2.7** Research careers in the field of vision.
Skill/Concept	**HBS 2.8** Build components of the central nervous system on a skeletal model.
Skill/Concept	**HBS 2.9** Use an interactive website to manipulate ions in a membrane and generate an action potential in a neuron.
Skill/Concept	**HBS 2.10** Complete a laboratory investigation using data acquisition software and probes to explore reflexes in the human body.
Skill/Concept	**HBS 2.11** Design a feedback loop that shows how the body maintains proper blood glucose levels.
Skill/Concept	**HBS 2.12** Dissect a cow eye to observe key structures.
Skill/Concept	**HBS 2.13** Use a model of the human eye to simulate normal vision, as well as myopia and hyperopia
Skill/Concept	**HBS 2.14** Design an informative handout that explains the tests and procedures in an eye exam.
Strategic Thinking	**HBS 2.15** Construct a 3D, labeled model of a neuron.
Strategic Thinking	**HBS 2.16** Analyze physical symptoms of a patient and relate these symptoms to errors in chemical communication
Strategic Thinking	**HBS 2.17** Evaluate visual perception by testing depth perception, peripheral vision, color vision, and visual acuity.
Strategic Thinking	**HBS 2.18** Experiment with lenses to correct problems in vision.
Extended Thinking	**HBS 2.19** Design a "brain map" that links regions of the brain with

	specific human actions, emotions, personality traits or functions.
Extended Thinking	**HBS 2.20** Create an evidence board with a team and use this board to solve a medical mystery.
Extended Thinking	**HBS 2.21** Design an experiment to test factors that could impact reaction time.
Extended Thinking	**HBS 2.22** Analyze a case study, relate disease to an error in communication and create a presentation of findings.
Extended Thinking	**HBS 2.23** Use models from activities in the unit to demonstrate how an error in communication occurs and affects the function of other body systems.

Indicator #3: Power: digestive, respiratory, and urinary systems	
Webb's Leveling	Standard and Examples
Recall	**HBS 3.1** Complete an Internet investigation to learn about the structure and function of ATP.
Skill/Concept	**HBS 3.2** Use appropriate Internet sources to investigate the role of hormones in maintaining a water balance in the body and create a feedback loop describing the results.
Skill/Concept	**HBS 3.3** Create a chart comparing the role food, water and oxygen play in the human body.
Skill/Concept	**HBS 3.4** Use data acquisition software to measure lung capacity and absorption of oxygen from air.
Skill/Concept	**HBS 3.5** Build the organs of the urinary system on a skeletal model.
Skill/Concept	**HBS 3.6** Complete a dissection to explore the anatomy of the kidney.
Skill/Concept	**HBS 3.7** Complete mathematics calculations to estimate the filtration rate of the glomerulus.
Skill/Concept	**HBS 3.8** Add glands, hormones, and target organs that are involved in water balance to a graphic organizer, to feedback loops, as well as to a skeletal model.
Strategic Thinking	**HBS 3.9** Design and build a model of the human digestive system.
Strategic Thinking	**HBS 3.10** Outline what happens to a bite of food as it travels down the digestive tract.
Strategic Thinking	**HBS 3.11** Analyze diet by comparing energy inputs and outputs.
Strategic Thinking	**HBS 3.12** Analyze data collected using a spirometer to determine tidal volume, vital capacity, and minute volume.
Strategic	**HBS 3.13** Analyze data collected using an oxygen sensor to

Thinking	determine the change in oxygen concentration of inhaled air versus exhaled air.
Strategic Thinking	**HBS 3.14** Create a "map" or poster that shows the connections between urine and blood and demonstrates the exchange of ions and fluids that occurs across the nephron.
Strategic Thinking	**HBS 3.15** Analyze the urine of four fictional patients to diagnose disease and dysfunction in other human body systems.
Strategic Thinking	**HBS 3.16** Explore careers related to lung function by writing a resume for a respiratory therapist.
Extended Thinking	**HBS 3.17** Assess overall dietary health by preparing a detailed nutrition report for a fictional client.
Extended Thinking	**HBS 3.18** Design and carry out a laboratory experiment investigating the impact environmental changes can have on enzyme function.

Indicator #4: Movement: cardiovascular and muscular systems	
Webb's Leveling	Standard and Examples
Recall	**HBS 4.1** Use appropriate Internet research techniques to obtain information about the different types of synovial joints.
Recall	**HBS 4.2** Construct a spaghetti muscle to investigate muscle structure.
Recall	**HBS 4.3** Compare and contrast the structure of arteries, veins and capillaries.
Recall	**HBS 4.4** Use appropriate Internet research techniques to investigate the reaction of the body systems to moderate and intense exercise.
Skill/Concept	**HBS 4.5** Dissect and manipulate a cow elbow to learn about joint anatomy and motion.
Skill/Concept	**HBS 4.6** Build a heart and circulatory routes on a skeletal model.
Skill/Concept	**HBS 4.7** Find various pulse points around the body and use heart rate data to calculate and assess cardiac output.
Skill/Concept	**HBS 4.8** Measure range of motion of human joints using a goniometer.
Skill/Concept	**HBS 4.9** Use proper microscope technique to examine the different types of muscle tissue.
Skill/Concept	**HBS 4.10** Build simple arm muscles on a skeletal model to illustrate the rules of muscle structure and action.
Skill/Concept	**HBS 4.11** Sculpt a muscle group on a skeletal model.
Skill/Concept	**HBS 4.12** Measure peripheral pulses using Doppler ultrasound and

	calculate an ankle brachial index (ABI).
Skill/Concept	**HBS 4.13** Create a timeline of the body's response to the stages of exercise.
Skill/Concept	**HBS 4.14** Complete a laboratory investigation using data acquisition software and probes to explore muscle fatigue.
Skill/Concept	**HBS 4.15** Build nerve roots and nerves on a skeletal model.
Strategic Thinking	**HBS 4.16** Demonstrate terms that describe the types of movement possible at a joint and match range of motion photographs to specific actions.
Strategic Thinking	**HBS 4.17** Identify the action of "mystery muscles" by observing muscle structure.
Strategic Thinking	**HBS 4.18** Test the effect of varying solutions of ATP on the contraction of muscle tissue.
Strategic Thinking	**HBS 4.19** Trace blood flow in pulmonary and systemic circulation by creating a graphic organizer of the heart.
Strategic Thinking	**HBS 4.20** Design a way to explain the formation of varicose veins.
Strategic Thinking	**HBS 4.21** Analyze a four-part case that looks at the effects of smoking on circulation and blood pressure.
Extended Thinking	**HBS 4.22** Design a model to demonstrate the process of muscle contraction as well as the phenomenon of rigor mortis.
Extended Thinking	**HBS 4.23** Design an experiment to test the effect of feedback, coaching or competition on muscle fatigue.
Extended Thinking	**HBS 4.24** Design a comprehensive training plan for an athlete training for a particular event.
Extended Thinking	**HBS 4.25** Present a detailed training plan to the perspective client.

Indicator #5: Defense: integumentary and immune systems	
Webb's Leveling	Standard and Examples
Recall	**HBS 5.1** Outline what happens inside the body when a person feels pain.
Recall	**HBS 5.2** Use appropriate Internet research techniques to obtain information about the different types of bone fractures.
Recall	**HBS 5.3** Draw diagrams of the stages of bone healing after injury.
Recall	**HBS 5.4** Use appropriate Internet research techniques to obtain information about the structure and function of the lymphatic and immune system.
Skill/Concept	**HBS 5.5** Dissect a section of long bone and draw a detailed diagram

	of relevant anatomy.
Skill/Concept	**HBS 5.6** Use proper microscope technique to view prepared slides of compact and spongy bone.
Skill/Concept	**HBS 5.7** Produce a feedback loop that illustrates how the body maintains a calcium balance.
Skill/Concept	**HBS 5.8** Build lymph vessels and nodes on a skeletal model.
Skill/Concept	**HBS 5.9** Graph antibody data collected after an infection and relate this data to the response of body cells.
Skill/Concept	**HBS 5.10** Use information presented in a computer animation to create a flow chart of immune response to a common cold.
Strategic Thinking	**HBS 5.11** Design and build a 3-D model of human skin displaying tissue layers and accessory organs.
Strategic Thinking	**HBS 5.12** Model and describe how damage to skin through burns can affect both the functions of the skin and other body systems.
Strategic Thinking	**HBS 5.13** Write diary entries that describe the role of various treatment methods and biomedical professionals in the care and rehabilitation of burn victims.
Strategic Thinking	**HBS 5.14** Analyze bone breaks shown in X-rays and match the images with descriptions of the injuries.
Strategic Thinking	**HBS 5.15** Write an advertisement for a job opening for an X-ray technician.
Strategic Thinking	**HBS 5.16** Analyze simulated blood samples to determine blood type and determine potential donors for a transfusion.
Strategic Thinking	**HBS 5.17** Produce and analyze a family pedigree for blood type.

Indicator #6: Homeostasis	
Webb's Leveling	Standard and Examples
Skill/Concept	**HBS 6.1** Use appropriate Internet research techniques to study the etiology, diagnosis and treatment of a disease or disorder.
Skill/Concept	**HBS 6.2** Model a disease and a medical intervention on a skeletal model.
Strategic Thinking	**HBS 6.3** Organize information about body function in detailed graphic organizers.
Strategic Thinking	**HBS 6.4** Trace disease in human systems by generating a fictional case study and compiling a patient case file.
Strategic Thinking	**HBS 6.5** Write a reflection on personal identity and on career aspirations.
Extended	**HBS 6.6** Design an innovative medical intervention or invention to

Thinking	protect the human body in extreme external environments.
Extended Thinking	**HBS 6.7** Create and present computer presentations to defend the design of a medical intervention.